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OWNER SAMPLER

WEIGH-A-DAY-A-MONTH

AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

A plan for every size herd

Dairy-Herd-Improvement Letter

ARS-44-204
(Vol. 44, No. 3)

May 1968

ARTIFICIAL INSEMINATION (AI) PARTICIPATION REPORT FOR THE
UNITED STATES 1967 1/

A total of 7,487,607 cows were bred artificially in the United States in 1967. Of these, 7,048,358 were dairy cows and 649,161 were beef cows. Not categorized were 150,088 first services reported as State totals only. Semen from dairy bulls was used to inseminate 6,259,425 dairy cows. Semen from beef bulls was used to inseminate 788,933 dairy cows in addition to the beef animals. These dairy animals bred to beef bulls represented 11.2 percent of the 7,048,358 dairy cattle bred artificially.

Because of incomplete reporting and the lack of information, the tabular data in this report are partly estimations. Where possible, estimates were based on the averages and percentages from complete reports. Where only the number of ampules of semen used were available, the number of first services were estimated to be one-half of the number of ampules reported.

1/ Prepared by B. T. McDaniel, C. A. Rampendahl, R. D. Plowman, and J. J. Corbin from data supplied by artificial insemination organizations, State Extension Dairymen, and the National Association of Animal Breeders.

Issued August 1968

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CURRENT SERIAL RECORDS

Table 1 shows that 48.1 percent of the Nation's 14,662,000 dairy cows and heifers were artificially inseminated in 1967. About 1.8 percent of the Nation's beef cows and heifers were artificially inseminated in the same period. Approximately 12 percent, or 844,280, of the dairy cattle so bred were registered.

The top 10 States in number and percentage of dairy and beef cattle bred artificially are shown in table 2. Wisconsin had the highest number of dairy cows, and Montana the highest number of beef cattle.

A comparison of the scope of artificial insemination by State for the years 1966 and 1967 is shown in table 3. The greatest increase in the number of dairy cows bred occurred in Wisconsin, and Montana had the greatest advance in beef cattle.

The number of cows bred artificially in the United States since 1939 is shown by year in table 4. The continual upward trend in the percentage of dairy cattle bred artificially is illustrated in figure 1.

Table 5 shows that 33 organizations bred cows artificially in 1967. These organizations serviced an estimated 458,782 herds. However, it should be noted that a herd was counted more than once when two or more AI studs bred cows in the same herd. It is estimated that 311,060 cows were bred by semen sold to individual farmers by the studs, and that 27,036 cows were bred by semen custom-frozen in addition to the 7,509,511 cattle serviced directly by their technicians.

Three organizations reported that they artificially inseminated 7,955 swine, which is 2,688 or 51.0 percent more than in 1966. Services to only 73 goats were indicated, a drop of 24.7 percent from 1966.

A total of 2,380 bulls were in AI studs in 1967. This probably exceeds the number of bulls actually in service in 1967, because it includes all bulls reported in studs at any time in 1967. It was possible to remove bulls without services from the counts only in cases where the stud reported an actual

TABLE 1.--Status of artificial breeding in the United States, January 1, 1968

State and other sources	Studs ^{1/}	Bred to dairy sires in 1967		Bred to beef sires in 1967		Services reported as State totals only ^{3/}	Dairy cattle		Beef cattle	
		Registered dairy cows ^{2/}	Total dairy cows	Dairy cows	Beef cows		All U.S. milk cows ^{4/}	Dairy cows bred as a percentage of all milk cows ^{5/}	Other U.S. cattle and calves 2 years and older ^{6/}	Beef cows bred as a percentage of other cattle and calves ^{7/}
Number	Number	Number	Number	Number	Number	Thousands	Percent	Thousands	Percent	
Alabama-----	0	3,660	39,617	5,635	3,650	148	166	27.3	863	0.4
Alaska-----	1	198	1,172	17	9	-----	2	59.5	2	.4
Arizona-----	0	868	9,376	851	5,033	2,131	55	18.6	376	1.3
Arkansas-----	0	2,581	20,250	3,167	4,264	3,997	114	20.5	845	.5
California-----	4	24,595	365,261	26,709	19,014	-----	857	45.7	1,005	1.9
Colorado-----	0	2,759	32,318	2,788	7,264	483	106	33.1	979	.7
Connecticut---	0	8,702	46,071	4,327	140	-----	77	65.5	4	3.5
Delaware-----	0	2,752	7,816	1,236	94	-----	17	53.2	4	2.4
Florida-----	0	13,426	143,297	22,063	15,294	50	189	87.5	846	1.8
Georgia-----	0	8,754	55,907	5,756	5,862	290	155	39.8	787	.7
Hawaii-----	0	897	9,634	1,013	1,480	175	16	66.5	89	1.7
Idaho-----	0	7,234	56,576	7,446	9,353	8,430	166	38.6	528	1.8
Illinois-----	1	26,628	166,138	23,991	17,576	505	386	49.3	782	2.2
Indiana-----	0	12,422	98,992	11,538	12,870	1,377	285	38.8	422	3.0
Iowa-----	0	23,780	196,391	32,914	23,002	-----	650	35.3	1,360	1.7
Kansas-----	1	11,107	83,631	7,305	37,493	1,278	240	37.9	1,710	2.2
Kentucky-----	0	11,875	105,519	16,825	14,658	3,987	421	29.1	956	1.5
Louisiana-----	1	9,521	64,680	7,658	8,465	480	206	35.1	883	1.0
Maine-----	0	8,615	45,493	5,023	94	225	79	63.9	10	.9
Maryland-----	1	11,668	74,783	9,857	2,521	-----	186	45.5	54	4.7
Massachusetts--	0	8,000	41,945	4,858	232	50	80	58.5	4	5.8
Michigan-----	2	46,922	266,679	28,593	6,361	13,641	519	56.9	116	5.5
Minnesota-----	1	32,742	538,224	73,605	15,362	18,712	1,181	51.8	518	3.0
Mississippi-----	1	5,871	52,275	4,175	8,138	-----	245	23.0	1,204	.7
Missouri-----	0	14,645	118,832	12,157	19,907	8,438	429	30.5	1,779	1.1
Montana-----	0	1,159	9,623	1,849	53,435	-----	51	22.5	1,525	3.5
Nebraska-----	0	3,080	41,054	4,392	22,386	7,880	235	19.3	1,964	1.1
Nevada-----	0	763	4,415	661	2,109	-----	15	33.8	305	.7
New Hampshire--	0	4,128	22,856	2,654	155	-----	45	56.7	2	7.8
New Jersey-----	0	12,379	50,703	6,612	350	1,031	90	63.7	7	5.0
New Mexico-----	0	2,437	24,574	1,734	891	178	40	65.8	696	.1
New York-----	1	118,833	650,386	77,092	2,895	7,533	1,172	62.1	54	5.4
North Carolina--	1	11,549	82,654	10,384	7,571	3,100	214	43.5	314	2.4
North Dakota---	0	874	17,208	2,573	19,999	-----	183	10.8	956	2.1
Ohio-----	2	48,982	255,065	40,968	17,916	8,237	535	55.3	333	5.4
Oklahoma-----	1	2,202	17,901	2,293	12,137	13,029	171	11.8	1,923	.6
Oregon-----	0	6,671	57,279	8,274	10,637	4,250	126	52.0	680	1.6
Pennsylvania---	3	120,070	470,012	65,323	10,120	10,000	823	65.0	98	10.3
Puerto Rico---	1	3,001	56,346	3,261	200	-----	---	---	---	---
Rhode Island---	0	1,492	4,324	467	54	-----	10	47.9	1	5.4
South Carolina--	0	4,023	30,960	4,634	4,586	25	82	43.4	237	1.9
South Dakota---	0	2,013	30,100	3,782	16,135	5,925	225	15.1	1,638	1.0
Tennessee-----	3	9,852	84,645	17,815	8,832	4,995	375	27.3	874	1.0
Texas-----	0	5,083	93,556	4,925	36,437	9,903	406	24.3	5,304	.7
Utah-----	1	6,438	47,569	4,829	4,549	-----	81	64.7	319	1.4
Vermont-----	0	20,427	114,561	13,575	398	1,072	236	54.3	4	10.0
Virginia-----	1	10,593	102,101	13,468	4,800	1,053	264	43.8	466	1.0
Washington-----	2	12,178	108,198	14,717	16,928	7,320	210	58.5	384	4.4
West Virginia--	0	2,231	19,123	5,165	2,531	-----	77	31.5	183	1.4
Wisconsin-----	4	132,930	1,214,622	156,650	20,799	-----	2,147	63.9	208	10.0
Wyoming-----	0	670	4,513	1,329	9,883	160	22	26.6	699	1.4
Reported AI activity, but State unknown ^{8/}	-	-----	4,200	-----	16,329	-----	---	---	---	---
International Beef Breeders ^{9/}	-	-----	-----	-----	48,335	-----	---	---	---	---
Semen services reported from ranchers' bulls ^{9/} -----	-	-----	-----	-----	59,628	-----	---	---	---	---
United States--	33	844,280	6,259,425	788,933	649,161	150,088	14,662	48.1	35,300	1.8

1/ States without studs purchase semen from studs in other States. See table 7 for name and location of studs.

2/ Data for registered cows may have been all or partially estimated when incomplete report was given.

3/ These are total first services by State as reported by Carnation Farms Breeding Service.

4/ Preliminary figures for number of cows and heifers 2 years old and over kept for milk; estimated by the Statistical Reporting Service (USDA).

5/ Percentage of all dairy cows bred included in the artificial insemination program.

6/ Preliminary figures for other cattle and calves 2 years and older; estimated by the Statistical Reporting Service (USDA).

7/ Percentage of all beef cows bred in the artificial insemination program.

8/ AI breeding activity reported for: Curtiss, 3,000 cows; NEBA, 20 cows; Mississippi ABC, 1,700 cows; Select Sires, 14,771 cows; Virginia ABA, 1,038 cows. Total: 20,529 cows. Data were received from studs and NAAB (see footnote 9 for name and address of NAAB).

9/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Missouri 65201.

TABLE 2.--States with the highest number and percentage of dairy and beef cows bred artificially in 1967

DAIRY COWS

Rank	State	Cows bred artificially	Rank	State	Cows bred artificially
		<u>Number</u>			<u>Percent</u>
1	Wisconsin	1,371,272	1	Florida	87.5
2	New York	727,478	2	Hawaii	66.5
3	Minnesota	611,829	3	New Mexico	65.8
4	Pennsylvania	535,335	4	Connecticut	65.5
5	California	391,970	5	Pennsylvania	65.0
6	Ohio	296,033	6	Utah	64.7
7	Michigan	295,272	7	Maine	63.9
8	Iowa	229,305	8	Wisconsin	63.9
9	Illinois	190,129	9	New Jersey	63.7
10	Florida	165,360	10	New York	62.1

BEEF COWS

1	Montana	53,435	1	Pennsylvania	10.3
2	Kansas	37,493	2	Vermont	10.0
3	Texas	36,437	3	Wisconsin	10.0
4	Iowa	23,002	4	New Hampshire	7.8
5	Nebraska	22,386	5	Massachusetts	5.8
6	Wisconsin	20,799	6	Michigan	5.5
7	North Dakota	19,999	7	New York	5.4
8	Missouri	19,907	8	Ohio	5.4
9	California	19,014	9	Rhode Island	5.4
10	Ohio	17,916	10	New Jersey	5.0

TABLE 3.--Comparison of artificial breeding in the United States for years 1966 and 1967

State	Dairy cows bred artificially in--				Beef cows bred artificially in--			
	1966	1967	Increase or decrease	Increase or decrease ^{1/}	1966	1967	Increase or decrease	Increase or decrease ^{2/}
	Number	Number	Number	Percent	Number	Number	Number	Percent
Alabama-----	47,254	45,252	-2,002	+0.6	2,189	3,650	+1,461	+0.1
Alaska-----	783	1,189	+406	+22.2	-----	9	+9	+4
Arizona-----	19,036	10,227	-8,809	-15.4	6,863	5,033	-1,830	-5
Arkansas-----	27,632	23,417	-4,215	-1.6	3,614	4,264	+650	+1
California-----	389,725	391,970	+2,245	-6	15,153	19,014	+3,861	+4
Colorado-----	35,228	35,106	-122	+2	5,747	7,264	+1,517	+1
Connecticut-----	49,499	50,398	+899	+1.2	596	140	-456	-11.4
Delaware-----	8,685	9,052	+367	+4.9	150	94	-56	-2.6
Florida-----	135,132	165,360	+30,228	+16.0	11,783	15,294	+3,511	+5
Georgia-----	58,051	61,663	+3,612	+4.2	4,474	5,862	+1,388	+1
Hawaii-----	7,262	10,647	+3,385	+21.1	1,312	1,480	+168	+2
Idaho-----	77,411	64,022	-13,389	-6.7	6,825	9,353	+2,528	+5
Illinois-----	210,676	190,129	-20,547	-1.0	22,465	17,576	-4,889	-8
Indiana-----	132,024	110,530	-21,494	-2.1	13,555	12,870	-685	-2
Iowa-----	161,337	229,305	+67,968	+12.5	29,350	23,002	-6,348	-5
Kansas-----	88,053	90,936	+2,883	+2.0	44,298	37,493	-6,805	-5
Kentucky-----	129,854	122,344	-7,510	-1.1	15,899	14,658	-1,241	-3
Louisiana-----	70,038	72,338	+2,300	+2.5	10,987	8,465	-2,522	-2
Maine-----	49,185	50,516	+1,331	0	92	94	+2	-1
Maryland-----	85,829	84,640	-1,189	+3	2,306	2,521	+215	+3
Massachusetts-----	50,590	46,803	-3,787	-6.4	823	232	-591	-14.8
Michigan-----	317,169	295,272	-21,897	+8	8,280	6,361	-1,919	-1.2
Minnesota-----	627,419	611,829	-15,590	+8	12,046	15,362	+3,316	+4
Mississippi-----	51,967	56,450	+4,483	+3.1	5,023	8,138	+3,115	+3
Missouri-----	141,986	130,989	-10,997	-9	18,771	19,907	+1,136	0
Montana-----	13,640	11,472	-2,168	-2.3	33,966	53,435	+19,469	+1.2
Nebraska-----	46,833	45,446	-1,387	+3	22,117	22,386	+269	-1
Nevada-----	4,089	5,076	+987	+6.5	1,444	2,109	+665	+2
New Hampshire-----	26,574	25,510	-1,064	-2.4	116	155	+39	+2.0
New Jersey-----	58,461	57,315	-1,146	+6.9	447	350	-97	-2.5
New Mexico-----	25,683	26,308	+625	+3.2	1,182	891	-291	-1
New York-----	726,527	727,478	+951	+1.4	3,347	2,895	-452	-1.3
North Carolina-----	90,857	93,038	+2,181	+3.1	7,918	7,571	-347	-2
North Dakota-----	26,543	19,781	-6,762	-2.1	15,053	19,999	+4,946	+6
Ohio-----	308,083	296,033	-12,050	0	22,295	17,916	-4,379	-1.7
Oklahoma-----	23,938	20,194	-3,744	-2.0	7,564	12,137	+4,573	+2
Oregon-----	66,552	65,553	-999	+1.6	5,736	10,637	+4,901	+7
Pennsylvania-----	558,560	535,335	-23,225	-9	10,499	10,120	-379	0
Puerto Rico-----	50,712	59,607	+8,895	-----	-----	200	+200	----
Rhode Island-----	4,412	4,791	+379	+3.8	3	54	+51	+5.1
South Carolina-----	33,182	35,594	+2,412	+3.4	3,822	4,586	+764	+3
South Dakota-----	33,090	33,882	+792	+7	10,200	16,135	+5,935	+4
Tennessee-----	97,343	102,460	+5,117	+2.7	19,420	8,832	-10,588	-1.2
Texas-----	104,750	98,481	-6,269	-7	29,697	36,437	+6,740	+1
Utah-----	52,789	52,398	-391	+1.1	4,126	4,549	+423	+1
Vermont-----	121,418	128,136	+6,718	+2.2	771	398	-373	-9.3
Virginia-----	113,809	115,569	+1,760	+2.0	7,021	4,800	-2,221	-5
Washington-----	141,864	122,915	-18,949	-6.9	9,608	16,928	+7,320	+1.9
West Virginia-----	24,212	24,288	+76	+2.0	2,507	2,531	+24	0
Wisconsin-----	1,280,240	1,371,272	+91,032	+5.2	19,408	20,799	+1,391	0
Wyoming-----	6,143	5,842	-301	-1.3	9,271	9,883	+612	0
AI activity reported by studs, but State unknown 3/-----	274,451	4,200	-270,251	----	13,156	16,329	+3,173	----
International Beef Breeders 3/-	-----	-----	-----	----	49,175	48,335	-840	----
Semen services reported from ranchers' bulls 3/-----	-----	-----	-----	----	94,673	59,628	-35,045	----
United States 4/--	7,286,580	7,048,358	-238,222	+2	647,143	649,161	+2,018	-1

^{1/} Derived from all dairy cows bred in the artificial insemination program as a percentage of all milk cows in the United States.

^{2/} Derived from all beef cows bred in the artificial insemination program as a percentage of other cattle and calves 2 years and older in the United States.

^{3/} For year 1967, see table 1 and footnotes. For year 1966, see table 1 and footnotes in the April 1967 Dairy Herd Improvement Letter covering the Artificial Insemination Participation Report for 1966.

^{4/} Does not include breakdown of 150,088 first services reported by Carnation Farms Breeding Service. See table 1 for services reported as State totals only.

TABLE 4.--Status of artificial breeding program in the United States (1939-1968, inclusive)

Year	Studs	Sires in service				Herds ^{1/}	Dairy cows bred to-		Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
		Dairy	Beef	Total	Average per stud		Dairy bulls	Beef bulls			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1939	7	--	--	33	4.7	646	--	--	--	7,359	228
1940	25	--	--	138	5.5	2,971	--	--	--	33,977	246
1941	35	--	--	237	6.8	5,997	--	--	--	70,751	299
1942	46	--	--	412	9.0	12,118	--	--	--	112,788	274
1943	59	--	--	574	9.7	23,448	--	--	--	182,524	318
1944	56	--	--	657	11.7	28,627	--	--	--	218,070	332
1945	67	--	--	729	10.9	43,998	--	--	--	360,732	495
1946	78	--	--	900	11.5	73,293	--	--	--	537,376	597
1947	84	--	--	1,453	17.3	140,571	--	--	--	1,184,168	815
1948	91	--	--	1,745	19.2	224,493	--	--	--	1,713,581	982
1949	90	--	--	1,940	21.6	316,177	--	--	--	2,091,175	1,078
1950	97	--	--	2,104	21.7	409,300	--	--	--	2,619,555	1,245
1951	94	--	--	2,187	23.3	548,300	--	--	--	3,509,573	1,605
1952	94	--	--	2,324	24.7	671,100	--	--	--	4,295,243	1,848
1953	96	--	--	2,598	27.1	755,000	--	--	--	4,845,222	1,865
1954	93	--	--	2,661	28.6	805,000	--	--	--	5,155,240	1,937
1955	79	--	--	2,450	31.0	845,900	--	--	--	5,413,874	2,210
1956	79	--	--	2,553	32.3	900,400	--	--	--	5,762,656	2,257
1957	75	--	--	2,651	35.3	946,000	--	--	--	6,055,982	2,284
1958	71	--	--	2,676	37.7	975,372	--	--	--	6,645,568	2,483
1959	64	--	--	2,460	38.4	930,059	--	--	--	6,932,294	2,816
1960	62	--	--	2,544	41.0	910,000	--	--	--	7,144,679	2,808
1961	56	--	--	2,486	44.4	863,781	7,047,148	2/435,592	--	7,482,740	3,010
1962	56	2,036	420	2,456	43.9	862,150	6,837,681	2/911,006	--	7,748,687	3,155
1963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
1964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
1965	3/46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	7,879,982	3,402
1966	3/44	1,949	439	2,388	54.3	540,265	6,413,453	873,127	647,143	7,933,723	3,322
1967	35	2,012	364	2,376	67.9	458,782	6,259,425	788,933	649,161	4/5/7,847,607	3,303
1968	3/33	2,028	352	2,380	72.1	--	--	--	--	--	--

1/ Prior to 1963, number of herds largely reflected membership rather than those actually serviced.

2/ Probably includes some beef to beef inseminations.

3/ Includes one all-beef stud.

4/ Not shown are inseminations to 7,955 swine and 73 goats.

5/ Total cattle bred in 1967 includes 150,088 first services, by State only, where breakdowns were not reported.

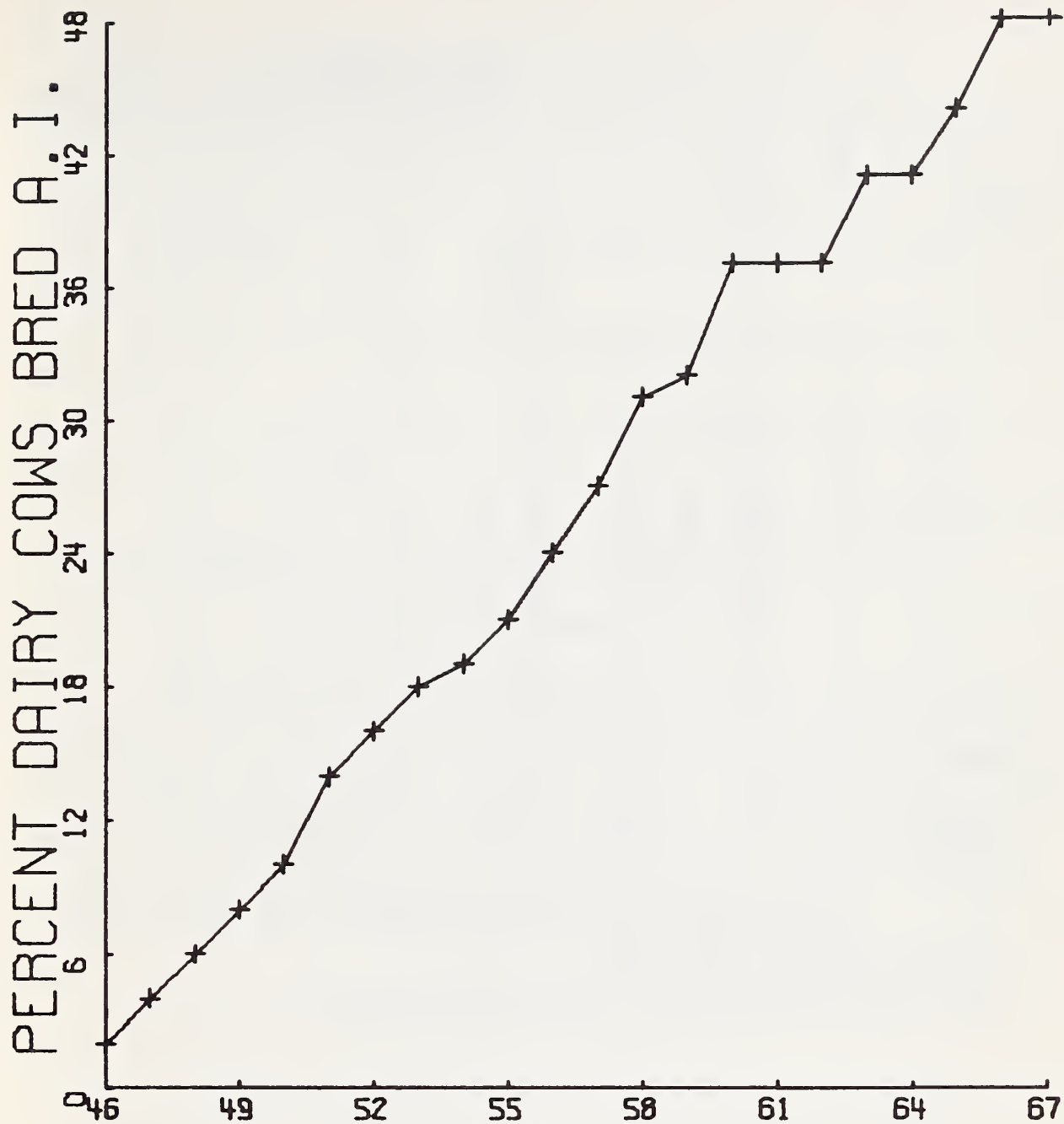


FIGURE 1.--Yearly trends in the percentage of U.S. dairy cows bred artificially since 1946.

TABLE 5.--Cows bred in artificial-breeding organization bull studs during 1967

Stud code	Name of stud ^{1/}	Herds serviced	Cows bred in 1967								Estimated total number of cows bred	Total bulls used ^{2/}	Insemina- tions of-- Swine Goats	
			First services				Semen transactions							
			Dairy total	Dairy to beef	Beef to beef	Total first services	Dairy to dairy	Beef to beef	Dairy to dairy	Beef to beef				
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
2110	Eastern AIC-----	37,141	656,071	76,968	818	733,857	5,230	252	----	----	739,339	316	----	--
2301	Zimmerman-----	3/44	700	-----	-----	700	-----	-----	-----	-----	700	4	----	--
2309	Atlantic-----	15,341	190,273	27,559	5,718	223,550	350	50	----	----	223,950	71	----	28
2311	NEBA-----	12,377	168,723	23,529	1,250	193,502	928	-----	300	----	194,730	97	----	6
3102	NOBA-----	3/10,384	210,971	39,094	9,837	259,902	5,960	67	----	----	265,929	75	----	5
3303	Curtiss-----	49,300	995,391	130,010	65,000	1,190,401	-----	-----	-----	3,000	1,193,401	187	----	--
3401	Michigan ABC-----	3/13,481	189,447	21,876	4,366	215,689	1,019	-----	-----	-----	216,708	84	----	--
3407	General Genetics--	3/1,425	21,800	800	200	22,800	425	225	-----	-----	23,450	---	----	--
3503	East Central-----	4,500	77,414	13,000	500	90,914	7,284	-----	-----	-----	98,198	42	----	--
3505	Tri-State-----	19,503	376,394	47,199	7,757	431,350	17,578	173	3,013	----	452,114	91	7,716	2
3521	Midwest Breeders--	43,179	578,586	78,823	22,167	679,576	56,436	14,108	-----	-----	750,120	140	----	--
3575	ABS-----	3/95,893	1,235,845	135,431	163,008	1,534,284	-----	-----	-----	-----	1,534,284	363	----	--
4101	Minnesota Valley--	41,472	275,712	42,778	4,754	323,244	300	8,100	-----	-----	331,644	147	----	--
4801	Kansas ABSU-----	3,000	41,710	2,854	21,141	65,705	2,651	10,330	-----	-----	78,686	41	----	12
5102	Maryland-W. Va----	4,550	69,508	12,338	4,157	86,003	2,509	3,103	-----	-----	91,615	61	----	6
5201	Virginia ABA-----	7,220	63,634	9,241	1,842	74,717	3,001	1,925	-----	-----	79,643	32	----	--
5501	N.C. Inst. B.P-----	12	964	-----	-----	964	63	-----	-----	-----	1,027	17	----	--
6102	Select Sires-----	3/37,658	271,999	46,699	42,923	361,621	86,793	30,946	325	10,398	490,083	173	233	14
6301	East Tennessee-----	7,600	20,030	3,860	2,679	26,569	770	115	-----	-----	27,454	26	----	--
6302	Tennessee ABA-----	6,000	22,792	9,083	800	32,675	2,200	-----	-----	-----	34,875	27	----	--
6303	West Tennessee----	1,470	4,706	780	2,304	7,790	-----	-----	-----	-----	7,790	21	----	--
6502	Mississippi ABC----	300	19,850	2,700	2,000	24,550	5,000	100	-----	-----	29,650	12	----	--
7201	Louisiana ABC-----	5,769	60,587	7,503	7,008	75,098	1,450	1,080	-----	-----	77,628	36	----	--
8701	Cache Valley-----	6,580	59,631	3/8,681	3/33,911	102,223	-----	9,157	-----	-----	111,380	52	----	--
9111	Carnation-----	3/11,055	137,942	25,694	13,236	176,872	-----	-----	-----	-----	4/326,960	90	----	--
9113	All West-----	19,142	136,870	21,189	21,729	179,788	-----	-----	-----	-----	179,788	70	----	--
9302	Adohr-----	7	3,456	-----	-----	3,456	2,558	-----	-----	-----	6,014	17	----	--
9303	Excelsior-----	163	23,884	150	50	24,084	9,249	25	-----	-----	33,358	28	----	--
9310	Pacific-----	500	25,559	892	580	27,031	2,125	-----	-----	-----	29,156	34	----	--
9316	Genetics, Inc-----	3/3,316	51,874	185	1,000	53,059	10,000	1,000	9,900	100	74,059	14	----	--
9401	P.R. AI Center-----	350	28,338	-----	200	28,538	-----	-----	-----	-----	28,538	9	6	--
9601	Matanuska Valley--	50	922	3/17	3/9	948	-----	-----	-----	-----	948	3	----	--
Report by individual dairyman-----														
		-----	-----	-----	-----	-----	425	-----	-----	-----	425	---	----	--
STUDS OR RANCHERS SERVICING ONLY BEEF CATTLE														
7304	C.H.Coddling & Sons	-----	-----	-----	-----	-----	-----	6,000	-----	-----	6,000	---	----	--
8406	International Beef Breeders ^{5/} -----	-----	-----	-----	48,335	48,335	-----	-----	-----	-----	48,335	---	----	--
	Semen services reported from ranchers' bulls ^{5/} -----	-----	-----	-----	59,628	59,628	-----	-----	-----	-----	59,628	---	----	--
United States-----		458,782	6,021,583	788,933	548,907	7,359,423	224,304	86,756	13,538	13,498	7,847,607	2,380	7,955	73

^{1/} See table 7 for list of names and addresses of studs.^{2/} See table 6 for breakdown of bulls by stud, by breed.^{3/} Data may have been all or partially estimated when incomplete report was given.^{4/} Includes 150,088 first services, by State only, for which breakdowns were not reported.^{5/} Information obtained from National Association of Animal Breeders, P. O. Box 1033, Columbia, Missouri 65201.

or estimated number of services by each individual bull.

The distribution of the 2,028 dairy bulls by type of service and breed is shown in table 6. About 54 percent of the dairy bulls were available in regular service, 37 percent were involved in progeny testing only, and the remaining 8 percent were available only on a special service basis. Only 1,596 of the dairy bulls were reported as having semen available on January 1, 1968. Most of the 352 beef bulls were reported as in regular service.

Table 7 lists artificial breeding organizations active in 1967.

The accompanying map illustrates the AI density in the United States in 1967.

Shown on the last page is an updated list of Extension Dairymen in charge of AI activity in each State.

MAY 1968 SIRE SUMMARY RESULTS

Included in tables 8 through 14 are the results of the May 1968 sire summary. The first two show the distribution of Repeatability on bulls summarized by breed, and by number and percent, respectively. Table 10 is a breakdown of new and updated summaries of bulls, by breed. Tables 11 through 14 are grouped by breed, showing ranges of the Predicted Differences of active AI bulls according to 50 percent or more Repeatability or 49 percent or less Repeatability.

TABLE 6.--Bulls used in artificial-breeding organization bull studs during 1967

Stud code	Name of stud ^{1/}	Bulls by breed ^{2/}									Type of service by dairy bulls		
		Ayr-shire	Brown Swiss	Guernsey	Holstein	Jersey	Red Dane	Short-horn	Beef	Total	Regular	Special or planned mating	Progeny testing
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
2110	Eastern AIC-----	15	11	33	203	45	--	--	9	316	89	27	191
2301	Zimmerman-----	--	--	--	4	--	--	--	--	4	4	--	--
2309	Atlantic-----	2	3	13	33	5	--	--	15	71	55	1	--
2311	NEBA-----	5	4	14	60	9	--	--	5	97	65	4	23
3102	NOBA-----	--	4	13	35	17	--	--	6	75	37	13	19
3303	Curtiss-----	6	6	15	89	14	--	3	54	187	125	4	4
3401	Michigan ABC-----	--	2	10	53	7	4	3	5	84	33	13	33
3407	General Genetics--	--	--	--	--	--	--	--	--	--	--	--	--
3503	East Central-----	--	1	3	32	--	--	--	6	42	25	11	--
3505	Tri-State-----	--	2	19	49	4	--	2	15	91	40	22	14
3521	Midwest Breeders--	--	9	15	94	3	--	3	16	140	66	13	45
3575	ABS-----	3	4	11	278	16	--	1	50	363	87	21	205
4101	Minnesota Valley--	5	5	14	93	2	--	5	23	147	64	5	55
4801	Kansas ABSU-----	2	3	2	23	3	--	2	6	41	25	1	9
5102	Maryland-W. Va---	5	4	8	31	7	--	--	6	61	29	--	26
5201	Virginia ABA-----	1	--	6	17	6	--	--	2	32	14	1	15
5501	N.C. Instit. B.P--	--	--	--	17	--	--	--	--	17	3	6	8
6102	Select Sires-----	3	15	21	92	17	--	4	21	173	76	--	76
6301	East Tennessee----	--	1	4	7	6	--	--	8	26	17	1	--
6302	Tennessee ABA-----	--	2	4	8	8	--	--	5	27	22	--	--
6303	West Tennessee----	--	--	--	8	5	--	--	8	21	13	--	--
6502	Mississippi ABC---	--	--	1	2	7	--	--	2	12	9	1	--
7201	Louisiana ABC-----	--	--	8	11	8	--	--	9	36	8	7	12
8701	Cache Valley-----	--	1	1	25	3	--	--	22	52	13	6	11
9111	Carnation-----	1	5	8	44	5	--	2	3/25	90	59	6	--
9113	All West-----	--	--	12	29	16	--	--	3/13	70	54	2	1
9302	Adohr-----	--	--	7	10	--	--	--	--	17	17	--	--
9303	Excelsior-----	--	1	--	27	--	--	--	--	28	16	3	9
9310	Pacific-----	--	--	2	6	5	--	--	21	34	13	--	--
9316	Genetics, Inc-----	--	--	1	12	1	--	--	--	14	14	--	--
9401	P.R. AI Center----	--	--	--	9	--	--	--	--	9	9	--	--
9601	Matanuska Valley--	--	--	--	3	--	--	--	--	3	2	1	--
United States-----		48	83	245	1,404	219	4	25	352	2,380	1,103	169	756

^{1/} See table 7 for list of names and addresses of studs.^{2/} These counts are based on where bulls are housed and does not reflect the fact that they are available to more than one stud.^{3/} Based on report of January 1, 1967.

TABLE 7.--Artificial-breeding organization bull studs in the United States

State	Stud code	Name and address
Alaska-----	9601	Matanuska Valley Breeders Association, Palmer 99645.
California-----	9302	Adohr Farms Inseminating Service, P.O. Box 88, Camarillo 93010.
	9303	Excelsior Breeding Service, 7401 Adams, Rt. 1, Box 128, Corona 91720.
	9316	Genetics, Inc., P.O. Box 134, Hughson 95326.
	1/9310	Pacific Breeders Co-op., Inc., 1464 Middle Two Rock Road, Petaluma 94952.
Illinois-----	3303	Curtiss Breeding Service, Inc., Cary 60013.
Kansas-----	4801	Kansas ABS Unit, Kansas State University, Anderson Hall, Manhattan 66502.
Louisiana-----	7201	La. Animal Breeders Co-op., Inc., Louisiana State University, Box BD, Baton Rouge 70803.
Maryland-----	5102	Maryland-West Virginia Bull Stud, Inc., Box 555, Frederick 21701.
Michigan-----	3407	General Genetics, P.O. Box 23, Jenison 49428.
	3401	Michigan Animal Breeders Co-op., Inc., P.O. Box 511, East Lansing 48824.
Minnesota-----	4101	Minnesota Valley Breeders Association, New Prague 56071.
Mississippi-----	6502	Mississippi Animal Breeders Co-op., Drawer BA, State College 39762.
New York-----	2110	Eastern Artificial Insemination Co-op., Inc., P.O. Box 518, Ithaca 14850.
North Carolina---	5501	N.C. Institutional Breeding Association, Department of Animal Science, North Carolina State University, Raleigh 27600.
Ohio-----	3102	NOBA, Inc., P.O. Box 607, Tiffin 44883.
	6102	Select Sires, Inc., 1224 Alton-Darby Road, Columbus 43228.
Pennsylvania-----	2309	Atlantic Breeders Co-op., Rt. 230 By-Pass, Lancaster 17604.
	2311	Northeastern Breeders Association, Inc., R.D. 2, Tunkhannock 18657.
	2301	Zimmerman Dairy Farm, Rt. 2, Lehighton 18235.
Puerto Rico-----	9401	Puerto Rico Artificial Insemination Center, Inc., P.O. Box 958, Dorado 00646.
Tennessee-----	6301	East Tennessee ABA, Rt. 10, Tipton Station Road, Knoxville 37920.
	6302	Tennessee Artificial Breeding Association, Rt. 2, Granny White Pike, Brentwood 37027.
	6303	West Tennessee ABA, P.O. Box 38, Yorkville 38389.
Utah-----	8701	Cache Valley Breeding Association, 1950 North Main, Logan 84321.
Virginia-----	5201	Virginia Animal Breeders Association, Inc., P.O. Drawer 370, Rocky Mount 24151.
Washington-----	9113	All West Breeders, P.O. Box 197, Burlington 98233.
	9111	Carnation Farms Breeding Service, Carnation 98014.
Wisconsin-----	3575	American Breeders Service, Inc., De Forest 53532.
	3503	East Central Breeders Association Co-op., P.O. Box 191, Waupun 53963.
	3521	Midwest Breeders Co-op., P.O. Box 469, Shawano 54166.
	3505	Tri-State Breeders Co-op., Westby 54667.
ALL-BEEF STUDS		
Colorado-----	8406	International Beef Breeders, Inc., P.O. Box 29007, Denver 80229.
Oklahoma-----	7304	C. H. Coddling and Sons, Foraker 74638.

1/ Merged with Genetics, Inc., in 1967 and no longer an active stud.

DAIRY COWS BRED ARTIFICIALLY, 1967

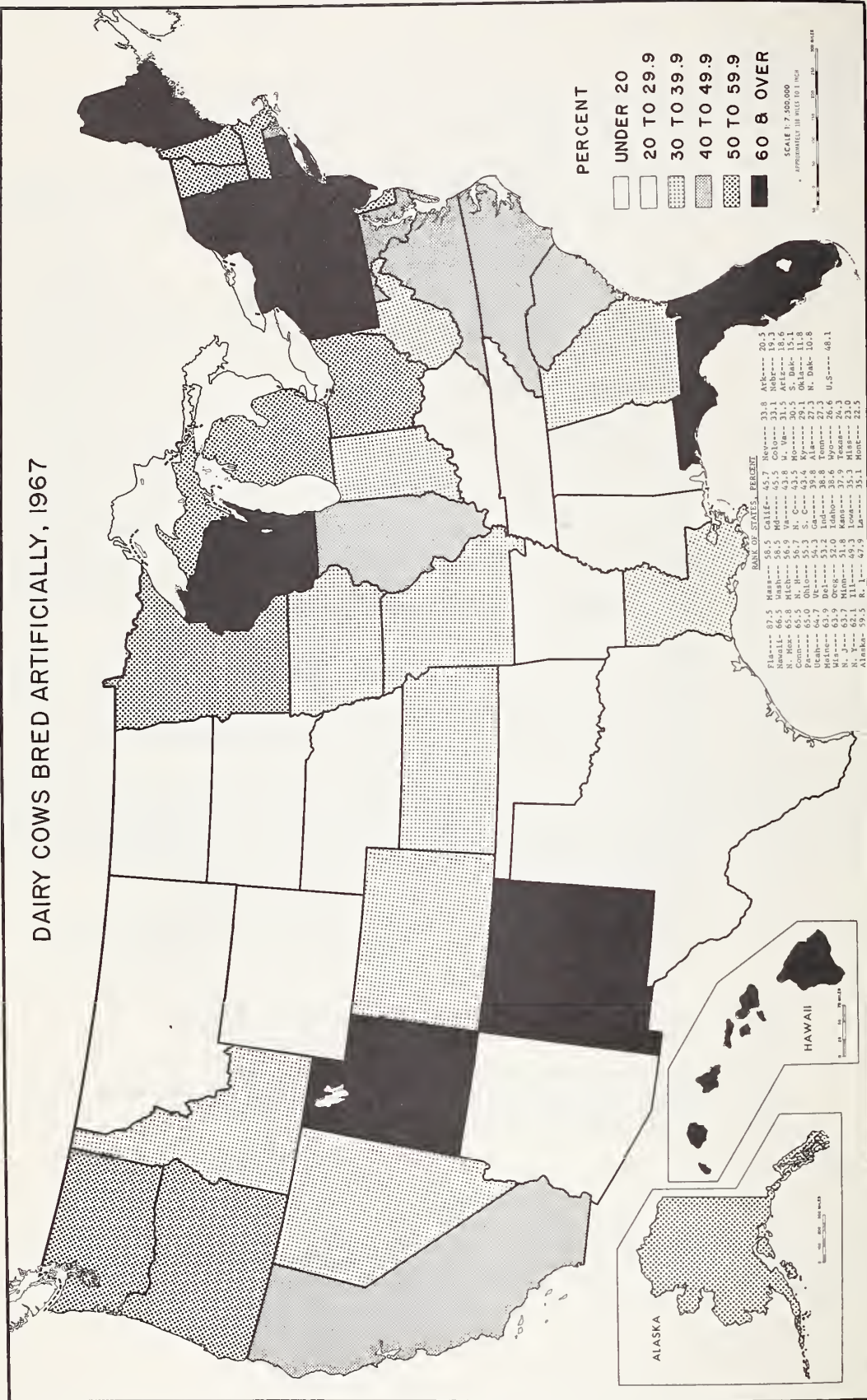


TABLE 8 .--Number of bulls summarized in May 1968 with various repeatabilities

Percentage group	Breed of sire								
	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	M.Shorthorn	Red Dane	Red Poll	Total
<hr/>									
	<u>Number</u>								
17 to 19--	21	70	299	56	11	5	--	--	462
20 to 29--	174	881	2,926	712	175	30	1	2	4,901
30 to 39--	115	584	1,755	450	122	24	1	--	3,051
40 to 49--	46	292	771	221	58	14	--	--	1,402
50 to 59--	27	136	349	107	47	8	1	--	675
60 to 69--	19	103	224	73	30	4	2	--	455
70 to 79--	16	119	182	100	51	--	--	--	468
80 to 89--	20	155	306	132	48	2	--	--	663
90 to 99--	6	38	263	19	14	--	--	--	340
Total---	444	2,378	7,075	1,870	556	87	5	2	12,417

TABLE 9 .--Percentage of bulls summarized in May 1968 with various repeatabilities

Percentage group	Breed of sire								
	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	M.Shorthorn	Red Dane	Red Poll	Total
<hr/>									
	<u>Percent</u>								
17 to 19--	4.73	2.94	4.23	2.99	1.98	5.75	-----	-----	3.72
20 to 29--	39.19	37.05	41.36	38.07	31.47	34.48	20.00	100.0	39.47
30 to 39--	25.90	24.56	24.81	24.06	21.94	27.59	20.00	-----	24.57
40 to 49--	10.36	12.28	10.90	11.82	10.43	16.09	-----	-----	11.29
50 to 59--	6.08	5.72	4.93	5.72	8.45	9.20	20.00	-----	5.44
60 to 69--	4.28	4.33	3.17	3.90	5.40	4.60	40.00	-----	3.66
70 to 79--	3.60	5.00	2.57	5.35	9.17	-----	-----	-----	3.77
80 to 89--	4.50	6.52	4.33	7.06	8.63	2.30	-----	-----	5.34
90 to 99--	1.35	1.60	3.72	1.02	2.52	-----	-----	-----	2.74
Total---	99.99	100.00	100.02	99.99	99.99	100.01	100.00	100.0	100.00

TABLE 10.--Sire summaries from May 1968

Breed	New summaries					Updated summaries				Total
	Bulls in AI studs--				Total new summaries	Bulls in AI studs--			Total updated summaries	
	With 10 or more AI daus.	With less than 10 AI daus.	Bulls in AI studs w/out AI daus.	Bulls not in AI studs		With AI daus.	W/out AI daus.	Bulls not in AI studs		
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Ayrshire----	--	2	--	4	6	78	8	352	438	444
Guernsey----	3	9	3	4	19	515	40	1,804	2,359	2,378
Holstein----	26	21	6	51	104	966	145	5,860	6,971	7,075
Jersey-----	--	6	4	9	19	390	42	1,419	1,851	1,870
Brown Swiss--	--	2	2	3	7	186	11	352	549	556
M.Shorthorn--	1	2	1	--	4	22	4	57	83	87
Red Dane----	--	--	--	--	--	4	---	1	5	5
Red Poll----	--	--	--	--	--	--	---	2	2	2
Total--	30	42	16	71	159	2,161	250	9,847	12,258	12,417

TABLE 11.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference

AYRSHIRE											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION		DAUGHTERS		HERO MATES		PREDICTED DIFF. MILK BUTTERFAT POUNDS POUNDS
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	
- 200 TO - 399	3	20.0%	510	791	10,882	4.1 443	11,287	4.0 454	-263	-5	
0 TO 199	5	33.3%	2,398	5,704	11,359	4.0 456	11,212	4.0 448	136	8	
200 TO 399	2	13.3%	799	1,036	11,590	3.8 443	11,264	4.0 447	292	-2	
400 TO 599	3	20.0%	384	646	11,597	3.8 445	10,974	4.0 435	500	9	
600 TO 799	1	6.7%	61	121	12,427	3.9 483	11,264	3.9 443	752	26	
1000 AND UP	1	6.7%	1,511	2,861	13,180	3.9 519	11,540	3.9 453	1,678	67	
TOTAL OR AV. BY SIRE UNWEIGHTED	15		5,663	11,159	11,535	3.9 456	11,212	4.0 446	294	10	
WEIGHTED BY NUMBER OF DAUGHTERS			5,663	11,159	11,542	3.9 456	11,207	4.0 446	302	10	

GUERNSEY											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION		DAUGHTERS		HERO MATES		PREDICTED DIFF. MILK BUTTERFAT POUNDS POUNDS
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	
- 400 TO - 599	3	5.1%	366	475	8,648	4.8 414	9,492	4.7 445	-497	-16	
- 200 TO - 399	4	6.8%	839	1,088	9,461	4.8 457	9,995	4.8 476	-322	-9	
- 1 TO - 199	7	11.9%	340	583	9,662	4.8 465	9,929	4.8 474	-117	-2	
0 TO 199	11	18.6%	1,260	2,143	9,827	4.7 462	9,712	4.7 461	118	3	
200 TO 399	19	32.2%	3,765	7,646	10,067	4.7 469	9,723	4.7 457	280	11	
400 TO 599	11	18.6%	5,210	8,910	10,286	4.6 476	9,886	4.7 459	511	15	
600 TO 799	4	6.8%	1,328	1,887	10,842	4.5 493	10,077	4.7 473	720	21	
TOTAL OR AV. BY SIRE UNWEIGHTED	59		13,108	23,332	9,954	4.7 467	9,769	4.7 462	195	7	
WEIGHTED BY NUMBER OF DAUGHTERS			13,108	23,332	9,956	4.7 467	9,769	4.7 462	197	7	

HOLSTEIN											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION		DAUGHTERS		HERO MATES		PREDICTED DIFF. MILK BUTTERFAT POUNDS POUNDS
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	
-1000 AND BELOW	2	.6%	177	181	12,963	3.8 497	14,569	3.7 537	-1,147	-24	
- 800 TO - 999	4	1.3%	465	747	13,328	3.7 499	14,583	3.6 531	-893	-20	
- 600 TO - 799	11	3.5%	1,774	2,465	13,758	3.8 519	14,777	3.6 529	-667	-10	
- 400 TO - 599	21	6.8%	12,384	21,700	13,767	3.7 506	14,506	3.6 528	-495	-12	
- 200 TO - 399	31	10.0%	17,043	28,249	14,023	3.7 515	14,499	3.6 527	-303	-5	
- 1 TO - 199	35	11.3%	13,142	20,648	14,175	3.7 519	14,392	3.6 522	-106	1	
0 TO 199	47	15.2%	17,364	30,020	14,485	3.6 528	14,422	3.6 525	115	5	
200 TO 399	48	15.5%	17,245	32,649	14,825	3.6 532	14,520	3.6 528	300	6	
400 TO 599	41	13.2%	19,127	33,669	15,003	3.6 542	14,487	3.6 527	486	15	
600 TO 799	29	9.4%	11,593	18,526	15,454	3.6 554	14,703	3.6 533	677	20	
800 TO 999	23	7.4%	12,737	20,053	15,536	3.5 550	14,512	3.6 529	895	20	
1000 AND UP	18	5.8%	4,918	7,486	16,013	3.5 565	14,704	3.7 537	1,209	28	
TOTAL OR AV. BY SIRE UNWEIGHTED	310		127,969	216,393	14,683	3.6 532	14,522	3.6 528	210	7	
WEIGHTED BY NUMBER OF DAUGHTERS			127,969	216,393	14,696	3.6 533	14,522	3.6 528	219	7	

TABLE 11.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference--Continued

JERSEY											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED OIFF. MILK BUTTERFAT		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS	HERO MILK POUNDS	MATES BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS	
- 600 TO - 799	3	5.7%	589	808	7,893	5.1 406	8,739	5.0 440	-677	-26	
- 400 TO - 599	1	1.9%	142	248	8,714	5.3 459	9,395	5.1 478	-458	-10	
- 200 TO - 399	4	7.5%	484	643	8,346	5.1 425	8,792	5.1 450	-314	-17	
- 1 TO - 199	6	11.3%	1,283	2,399	8,464	5.1 431	8,543	5.1 434	-60	-3	
0 TO 199	14	26.4%	2,833	5,328	9,186	5.1 472	9,109	5.1 468	101	7	
200 TO 399	14	26.4%	2,964	4,931	9,441	5.0 474	9,118	5.1 467	287	8	
400 TO 599	5	5.4%	548	1,048	9,794	5.0 488	9,152	5.1 464	504	20	
600 TO 799	4	7.5%	378	810	9,995	4.9 494	8,927	5.1 458	739	27	
800 TO 999	1	1.9%	136	248	10,614	4.9 516	9,706	5.1 493	868	25	
1000 AND UP	1	1.5%	38	79	10,930	5.2 567	9,361	5.2 491	1,129	56	
TOTAL OR AV. BY SIRE											
UNWEIGHTED	53		9,395	16,542	9,204	5.1 466	9,014	5.1 461	166	6	
WEIGHTED BY NUMBER OF DAUGHTERS			9,395	16,542	9,218	5.1 467	9,013	5.1 461	178	7	

BROWN SWISS											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS	HERO MILK POUNDS	MATES BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS	
- 400 TO - 599	10	41.7%	1,621	2,448	11,560	4.1 479	12,232	4.1 498	-486	-12	
- 200 TO - 399	1	4.2%	44	107	11,005	4.1 454	11,539	4.0 467	-363	-8	
- 1 TO - 199	2	8.3%	1,906	3,564	12,230	4.1 498	12,331	4.1 501	-55	0	
0 TO 199	4	16.7%	272	447	12,747	4.1 521	12,727	4.0 512	66	9	
200 TO 399	3	12.5%	729	1,268	12,729	4.0 514	12,456	4.1 514	266	3	
400 TO 599	1	4.2%	57	79	13,210	3.9 519	12,443	4.1 510	585	9	
600 TO 799	1	4.2%	70	95	13,969	4.0 555	13,136	4.1 541	718	15	
800 TO 999	1	4.2%	60	157	13,468	4.2 566	12,205	4.1 500	995	53	
1000 AND UP	1	4.2%	89	139	13,651	3.7 504	12,185	4.0 492	1,220	11	
TOTAL OR AV.											
BY SIRE											
UNWEIGHTED	24		4,848	8,304	12,273	4.1 500	12,365	4.1 503	-31	0	
WEIGHTED BY NUMBER OF DAUGHTERS											
			4,848	8,304	12,274	4.1 501	12,359	4.1 503	-24	1	

M. SHORTHORN											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS	HERO MATES MILK POUNDS	BUTTERFAT % POUNDS			
400 TO 599	1	100.0%	23	43	10,341	3.8 392	9,426	3.8 354	474	20	
TOTAL OR AV. BY SIRE											
UNWEIGHTED	1		23	43	10,341	3.8 392	9,426	3.8 354	474	20	
WEIGHTED BY NUMBER OF DAUGHTERS			23	43	10,341	3.8 392	9,426	3.8 354	474	20	

RED OANE											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS		HERO MATES MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
- 1 TO - 199	2	66.7%	99	161	12,641	3.9 492		12,824	3.9 502	-81	-4
200 TO 399	1	33.3%	75	154	13,246	3.9 513		12,890	3.9 504	260	7
TOTAL OR AV. BY SIRE											
UNWEIGHTED	3		174	315	12,842	3.9 499		12,846	3.9 503	33	0
WEIGHTED BY NUMBER OF DAUGHTERS			174	315	12,860	3.9 499		12,848	3.9 503	42	0

TABLE 12.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to butterfat production range of the Predicted Difference

AYRSHIRE											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
-10 TO -19	2	13.3%	968	1,267	11,395	3.9	442	4.0	11,561	4.0	459
-1 TO -9	2	13.3%	89	143	10,692	4.0	423	4.0	10,842	4.0	435
0 TO 9	5	33.3%	498	847	11,361	3.9	446	4.0	11,022	4.0	438
10 TO 19	4	26.7%	2,536	5,920	11,609	4.0	469	4.0	11,364	4.0	455
20 TO 29	1	6.7%	61	121	12,427	3.9	483	3.9	11,264	3.9	443
60 AND UR	1	6.7%	1,511	2,861	13,180	3.9	519	3.9	11,540	3.9	453
TOTAL OR AV. BY SIRE											
UNWEIGHTED	15		5,663	11,159	11,535	3.9	456	4.0	11,212	4.0	446
WEIGHTED BY NUMBER OF DAUGHTERS			5,663	11,159	11,542	3.9	456	4.0	11,207	4.0	446

GUERNSEY											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
-20 TO -29	1	1.7%	26	44	7,657	4.7	357	4.6	8,605	4.6	395
-10 TO -19	5	8.5%	617	948	9,558	4.7	447	4.7	10,068	4.7	477
-1 TO -9	11	18.6%	1,398	2,668	9,576	4.7	447	4.7	9,669	4.7	457
0 TO 9	16	27.1%	5,100	8,771	9,835	4.6	456	4.7	9,620	4.7	453
10 TO 19	18	30.5%	2,639	4,506	10,354	4.7	486	4.7	9,912	4.7	470
20 TO 29	6	10.2%	3,093	5,995	10,290	4.7	489	4.7	9,756	4.7	463
30 TO 39	2	3.4%	235	400	10,528	4.9	515	4.7	10,096	4.7	475
TOTAL OR AV. BY SIRE											
UNWEIGHTED	59		13,108	23,332	9,954	4.7	467	4.7	9,769	4.7	462
WEIGHTED BY NUMBER OF DAUGHTERS			13,108	23,332	9,956	4.7	467	4.7	9,769	4.7	462

HOLSTEIN											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
-40 TO -49	2	.6%	1,957	2,793	13,234	3.5	463	3.7	14,096	3.7	516
-30 TO -39	5	1.6%	3,016	3,875	13,724	3.6	488	3.6	14,722	3.6	535
-20 TO -29	11	3.5%	1,608	2,063	14,051	3.6	502	3.6	14,817	3.6	540
-10 TO -19	28	9.0%	11,946	19,577	13,946	3.6	500	3.6	14,406	3.6	522
-1 TO -9	54	17.4%	17,572	31,848	14,349	3.6	516	3.6	14,494	3.6	527
0 TO 9	79	25.5%	39,768	67,593	14,511	3.6	524	3.6	14,355	3.6	522
10 TO 19	71	22.9%	27,505	46,042	14,992	3.6	544	3.6	14,624	3.6	531
20 TO 29	32	10.3%	8,543	15,257	15,283	3.7	558	3.6	14,575	3.6	530
30 TO 39	16	5.2%	12,188	21,092	15,534	3.7	582	3.7	14,771	3.7	544
40 TO 49	9	2.9%	2,737	4,278	15,862	3.7	588	3.7	14,714	3.7	540
50 TO 59	2	.6%	896	1,452	15,149	3.8	579	3.7	14,402	3.7	528
60 AND UR	1	.3%	233	523	15,306	3.9	593	3.6	14,578	3.6	532
TOTAL OR AV. BY SIRE											
UNWEIGHTED	310		127,969	216,393	14,683	3.6	532	3.6	14,522	3.6	528
WEIGHTED BY NUMBER OF DAUGHTERS			127,969	216,393	14,696	3.6	533	3.6	14,522	3.6	528

TABLE 12.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to butterfat production range of the Predicted Difference--Continued

JERSEY

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	POUNDS
-20 TO -49	1	1.9%	106	149	7,964	5.0	396	8,926	5.1	454
-30 TO -39	1	1.9%	264	303	8,491	4.9	419	8,950	5.2	461
-20 TO -29	1	1.9%	364	520	7,600	5.1	386	8,385	5.0	418
-10 TO -19	7	13.2%	1,047	1,700	8,834	5.0	444	9,104	5.1	466
-1 TO -9	9	17.0%	1,968	3,739	8,934	5.0	444	8,969	5.1	455
0 TO 9	11	20.8%	2,783	4,832	9,005	5.0	452	8,806	5.1	447
10 TO 19	11	20.8%	1,621	3,091	9,511	5.1	482	9,109	5.1	466
20 TO 29	7	13.2%	638	1,160	9,791	5.2	505	9,256	5.2	478
30 TO 39	3	5.7%	510	855	9,516	5.3	502	8,856	5.2	461
40 TO 49	1	1.9%	56	114	9,853	5.3	523	9,263	5.1	473
50 TO 59	1	1.9%	38	79	10,930	5.2	567	9,361	5.2	491
TOTAL OR AV. BY SIRE										
UNWEIGHTED	53		9,395	16,542	9,204	5.1	466	9,014	5.1	461
WEIGHTED BY NUMBER OF DAUGHTERS			9,395	16,542	9,218	5.1	467	9,013	5.1	461

BROWN SWISS

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	POUNDS
-20 TO -29	2	8.3%	93	135	11,201	4.1	457	12,124	4.0	491
-10 TO -19	5	20.8%	818	1,163	11,652	4.0	469	12,121	4.1	492
-1 TO -9	5	20.8%	1,886	2,905	11,771	4.1	488	12,252	4.1	498
0 TO 9	5	20.8%	1,231	2,587	12,590	4.0	506	12,372	4.0	501
10 TO 19	6	25.0%	760	1,357	13,102	4.1	535	12,766	4.1	523
50 TO 59	1	4.2%	60	157	13,468	4.2	566	12,205	4.1	500
TOTAL OR AV. BY SIRE										
UNWEIGHTED	24		4,848	8,304	12,273	4.1	500	12,365	4.1	503
WEIGHTED BY NUMBER OF DAUGHTERS			4,848	8,304	12,274	4.1	501	12,359	4.1	503

M. SHORTHORN

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	POUNDS
20 TO 29	1	100.0%	23	43	10,341	3.8	392	9,426	3.8	354
TOTAL OR AV. BY SIRE										
UNWEIGHTED	1		23	43	10,341	3.8	392	9,426	3.8	354
WEIGHTED BY NUMBER OF DAUGHTERS			23	43	10,341	3.8	392	9,426	3.8	354

FED. OLANE

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	POUNDS
-10 TO -19	1	33.3%	37	45	12,542	3.8	482	12,814	3.9	506
0 TO 9	2	66.7%	137	270	12,993	3.9	507	12,862	3.9	501
TOTAL OR AV. BY SIRE										
UNWEIGHTED	3		174	315	12,842	3.9	499	12,846	3.9	503
WEIGHTED BY NUMBER OF DAUGHTERS			174	315	12,860	3.9	499	12,848	3.9	503

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference

AYRSHIRE											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF. MILK POUNDS	DIFF. BUTTERFAT POUNDS	
					MILK POUNDS	BUTTERFAT % POUNDS	HERO MILK POUNDS	MATES BUTTERFAT % POUNDS			
200 TO 399	399	2	28.6%	40	60	13,618	3.7 509	12,800	3.8 491	262	6
400 TO 599	599	4	57.1%	79	169	13,714	3.9 539	12,095	4.0 482	468	17
600 TO 799	799	1	14.3%	10	10	14,338	3.9 566	12,086	4.0 483	764	25
TOTAL OR AV. BY SIRE											
UNWEIGHTED		7		129	259	13,776	3.9 534	12,295	3.9 485	451	15
WEIGHTED BY NUMBER OF DAUGHTERS				129	259	13,741	3.9 534	12,287	3.9 485	447	15
GUERNSEY											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF. MILK POUNDS	DIFF. BUTTERFAT POUNDS	
					MILK POUNDS	BUTTERFAT % POUNDS	HERO MILK POUNDS	MATES BUTTERFAT % POUNDS			
- 400 TO - 599	1	2.0%	29	32	10,529	5.5 583	11,964	5.1 607	-465	-2	
- 200 TO - 399	3	6.1%	55	69	9,434	4.8 456	10,128	4.6 468	-236	-2	
- 1 TO - 199	10	20.4%	263	470	9,923	4.8 472	10,203	4.7 483	-64	-2	
0 TO 199	14	28.6%	282	471	10,759	4.8 517	10,583	4.8 505	105	7	
200 TO 399	14	28.6%	323	564	11,439	4.7 542	10,672	4.7 507	284	13	
400 TO 599	5	10.2%	107	183	12,905	4.5 580	11,402	4.8 544	529	15	
800 TO 999	2	4.1%	30	47	14,424	4.5 644	10,821	4.5 488	888	38	
TOTAL OR AV. BY SIRE											
UNWEIGHTED		49		1,089	1,836	11,065	4.7 524	10,625	4.7 504	164	8
WEIGHTED BY NUMBER OF DAUGHTERS				1,089	1,836	11,045	4.7 524	10,603	4.7 503	168	8
HOLSTEIN											
PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF. MILK POUNDS	DIFF. BUTTERFAT POUNDS	
					MILK POUNDS	BUTTERFAT % POUNDS	HERO MILK POUNDS	MATES BUTTERFAT % POUNDS			
- 800 TO - 999	1	.6%	32	53	12,236	4.0 494	14,762	3.7 543	-849	-14	
- 600 TO - 799	2	1.2%	34	34	12,546	3.7 466	14,281	3.7 524	-648	-19	
- 400 TO - 599	8	4.6%	177	259	13,573	3.8 512	14,956	3.7 551	-509	-13	
- 200 TO - 399	9	5.2%	132	169	13,554	3.7 504	14,417	3.6 525	-277	-5	
- 1 TO - 199	28	16.2%	1,081	2,087	14,790	3.7 541	15,182	3.6 547	-81	0	
0 TO 199	35	20.2%	1,060	2,010	15,385	3.7 565	15,195	3.7 557	125	6	
200 TO 399	42	24.3%	1,202	1,986	16,444	3.7 604	15,708	3.7 575	304	12	
400 TO 599	25	14.5%	646	1,127	16,929	3.6 608	15,640	3.6 570	487	15	
600 TO 799	13	7.5%	383	753	17,804	3.6 637	15,904	3.6 580	721	22	
800 TO 999	7	4.0%	167	266	18,648	3.7 685	16,056	3.7 591	868	33	
1000 AND UP	3	1.7%	76	131	17,724	3.4 597	15,077	3.5 534	1,150	27	
TOTAL OR AV. BY SIRE											
UNWEIGHTED		173		4,990	8,875	15,893	3.7 580	15,403	3.6 562	215	8
WEIGHTED BY NUMBER OF DAUGHTERS				4,990	8,875	15,903	3.7 581	15,399	3.6 562	222	9

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference--Continued

JERSEY

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERD MATES		MILK	BUTTERFAT
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
- 600 TO - 799	2	4.2%	31	31	7,219	5.4 392	8,913	5.1 458	-677	-24
- 400 TO - 599	1	2.1%	14	18	6,614	5.0 334	8,472	5.2 437	-566	-30
- 200 TO - 399	4	8.3%	111	185	8,565	5.3 451	9,429	5.2 488	-255	-11
- 1 TO - 199	5	10.4%	92	140	8,713	5.0 434	8,947	4.9 441	-58	-1
0 TO 199	16	33.3%	370	644	9,929	5.1 510	9,810	5.2 507	81	4
200 TO 399	12	25.0%	485	778	10,693	5.1 541	9,944	5.1 502	271	14
400 TO 599	7	14.6%	121	211	11,476	5.3 610	9,920	5.2 520	486	27
1000 AND UP	1	2.1%	17	39	10,398	4.8 503	8,354	5.0 416	1,008	43
TOTAL OR AV. BY SIRE										
UNWEIGHTED	48		1,241	2,050	9,933	5.1 511	9,642	5.1 494	119	7
WEIGHTED BY NUMBER OF DAUGHTERS			1,241	2,050	9,973	5.1 513	9,657	5.1 495	131	7

BROWN SWISS

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERD MATES		MILK	BUTTERFAT
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
0 TO 199	5	35.7%	88	122	13,479	4.2 560	13,264	4.2 554	107	5
200 TO 399	6	42.9%	140	299	14,185	4.0 566	13,289	4.1 541	313	10
400 TO 599	2	14.3%	38	57	13,326	4.0 528	12,245	4.0 492	499	18
800 TO 999	1	7.1%	17	24	14,031	4.0 565	12,256	4.0 491	808	34
TOTAL OR AV. BY SIRE										
UNWEIGHTED	14		283	502	13,799	4.0 559	13,057	4.1 535	302	11
WEIGHTED BY NUMBER OF DAUGHTERS			283	502	13,841	4.0 560	13,086	4.1 536	306	11

M. SHORTHORN

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERD MATES		MILK	BUTTERFAT
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
- 1 TO - 199	1	14.3%	33	75	9,727	3.7 357	10,280	3.7 384	-130	-6
0 TO 199	3	42.9%	60	121	9,616	3.6 344	9,001	3.7 329	145	4
200 TO 399	1	14.3%	15	24	10,724	3.5 374	9,689	3.7 357	332	6
600 TO 799	1	14.3%	10	25	10,881	3.5 386	9,025	3.6 326	647	21
800 TO 999	1	14.3%	31	71	12,274	3.5 426	9,780	3.5 344	859	28
TOTAL OR AV. BY SIRE										
UNWEIGHTED	7		149	316	10,350	3.6 368	9,397	3.6 343	306	9
WEIGHTED BY NUMBER OF DAUGHTERS			149	316	10,357	3.6 368	9,393	3.6 343	310	9

RED DANE

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
					DAUGHTERS		HERD MATES		MILK	BUTTERFAT
					MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
400 TO 599	1	100.0%	44	110	13,938	3.9 541	12,674	3.9 496	453	16
TOTAL OR AV. BY SIRE										
UNWEIGHTED	1		44	110	13,938	3.9 541	12,674	3.9 496	453	16
WEIGHTED BY NUMBER OF DAUGHTERS			44	110	13,938	3.9 541	12,674	3.9 496	453	16

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to butterfat production range of the Predicted Difference

AYRSHIRE											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
0 TO 9	2	28.6%	40	80	13,618	3.7	509	12,800	3.8	491	262
10 TO 19	2	28.6%	26	53	13,313	3.8	505	11,636	4.0	462	453
20 TO 29	3	42.9%	63	126	14,189	4.0	570	12,398	4.0	496	577
TOTAL OR AV.											
8Y SIRE											
UNWEIGHTED	7		129	259	13,776	3.9	534	12,295	3.9	485	451
WEIGHTED 8Y NUMBER OF DAUGHTERS			129	259	13,741	3.9	534	12,287	3.9	485	447
GUERNSEY											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
- 1 TO - 9	12	24.5%	269	403	9,939	4.7	469	10,306	4.7	489	-88
0 TO 9	15	30.6%	325	568	10,526	4.7	499	10,394	4.7	492	82
10 TO 19	16	32.7%	370	619	12,043	4.7	570	11,156	4.8	533	318
20 TO 29	4	8.2%	95	199	10,876	5.0	541	10,223	4.7	482	252
30 TO 39	2	4.1%	30	47	14,424	4.5	644	10,821	4.5	488	888
TOTAL OR AV.											
8Y SIRE											
UNWEIGHTED	49		1,089	1,836	11,065	4.7	524	10,625	4.7	504	164
WEIGHTED 8Y NUMBER OF DAUGHTERS			1,089	1,836	11,045	4.7	524	10,603	4.7	503	168
HOLSTEIN											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS		HERO MATES		MILK	BUTTERFAT	
					POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS	% POUNDS	POUNDS
-20 TO -29	3	1.7%	44	48	13,484	3.5	471	14,868	3.7	548	-456
-10 TO -19	9	5.2%	314	490	13,646	3.7	500	14,962	3.6	542	-451
- 1 TO - 9	25	14.5%	759	1,446	14,427	3.6	525	14,913	3.7	545	-144
0 TO 9	56	32.4%	1,664	2,852	15,880	3.6	570	15,573	3.6	565	170
10 TO 19	49	28.3%	1,521	2,867	16,192	3.7	597	15,333	3.7	563	349
20 TO 29	19	11.0%	424	724	16,948	3.7	633	15,531	3.6	566	534
30 TO 39	12	6.9%	264	448	18,406	3.7	682	16,181	3.6	587	794
TOTAL OR AV.											
8Y SIRE											
UNWEIGHTED	173		4,990	8,875	15,893	3.7	580	15,403	3.6	562	215
WEIGHTED 8Y NUMBER OF DAUGHTERS			4,990	8,875	15,903	3.7	581	15,399	3.6	562	222

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to butterfat production range of the Predicted Difference--Continued

JERSEY											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS	HERO MATES MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS	
-30 TO -39	2	4.2%	28	32	6,717	5.0	337	8,533	5.1	439	
-20 TO -29	1	2.1%	18	23	8,298	5.1	422	8,945	5.3	472	
-10 TO -19	2	4.2%	31	35	8,372	5.5	457	9,761	5.1	494	
- 1 TO - 9	9	18.8%	213	356	9,463	5.0	471	9,747	5.1	493	
0 TO 9	15	31.3%	546	875	9,851	5.1	502	9,581	5.1	491	
10 TO 19	9	18.8%	178	332	10,509	5.1	538	9,876	5.1	507	
20 TO 29	6	12.5%	157	282	10,252	5.2	536	9,172	5.1	468	
30 TO 39	2	4.2%	37	47	12,871	5.4	693	11,131	5.2	576	
40 TO 49	2	4.2%	33	68	11,779	5.4	640	9,838	5.3	521	
TOTAL OR AV. BY SIRE UNWEIGHTED	48		1,241	2,050	9,933	5.1	511	9,642	5.1	494	
WEIGHTED BY NUMBER OF DAUGHTERS			1,241	2,050	9,973	5.1	513	9,657	5.1	495	

BROWN SWISS											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	BUTTERFAT % POUNDS	HERO MATES MILK POUNDS	BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS	
- 1 TO - 9	1	7.1%	10	16	14,162	3.7	524	13,540	4.0	545	
0 TO 9	6	42.9%	129	220	13,685	4.1	555	13,268	4.1	546	
10 TO 19	5	35.7%	104	214	14,219	4.1	583	13,324	4.1	549	
20 TO 29	1	7.1%	23	28	11,789	4.1	484	10,780	4.0	433	
30 TO 39	1	7.1%	17	24	14,031	4.0	565	12,256	4.0	491	
TOTAL OR AV.											
BY SIRE											
UNWEIGHTED	14		283	502	13,799	4.0	559	13,057	4.1	535	
WEIGHTED BY NUMBER OF DAUGHTERS			283	502	13,841	4.0	560	13,086	4.1	536	

M. SHORTHORN											
PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.		
					DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT % POUNDS	HERO MATES MILK POUNDS	HERO MATES BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS	
- 1 TO - 9	1	14.3%	33	75	9,727	3.7	357	10,280	3.7	384	
0 TO 9	4	57.1%	75	145	9,893	3.6	351	9,173	3.7	336	
20 TO 29	2	28.6%	41	96	11,578	3.5	406	9,403	3.6	335	
TOTAL OR AV. BY SIRE UNWEIGHTED	7		149	316	10,350	3.6	368	9,397	3.6	343	
WEIGHTED BY NUMBER OF DAUGHTERS			149	316	10,357	3.6	368	9,393	3.6	343	

RED OANE											
PREDICTED DIFFERENCE BUTTERFAT RANGE		SIRE NUMBER	PERCENTAGE OF SIRE IN GROUP	DAUGHTERS WITH HERO MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION				PREDICTED DIFF.	
						DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT % POUNDS	HERO MATES MILK POUNDS	HERO MATES BUTTERFAT % POUNDS	MILK POUNDS	BUTTERFAT POUNDS
10 TO 19		1	100.0%	44	110	13,938	3.9 541	12,674	3.9 496	453	16
TOTAL OR AV. BY SIRE UNWEIGHTED											
		1		44	110	13,938	3.9 541	12,674	3.9 496	453	16
WEIGHTED BY NUMBER OF DAUGHTERS											
				44	110	13,938	3.9 541	12,674	3.9 496	453	16

AI BULL USAGE IN 1966 1/
B. T. McDaniel and R. D. Plowman 2/

There have been many changes in the artificial insemination industry (AI) in the past 20 years. For instance, the number of cows bred per bull in AI studs has tripled. Technical advancements have made it possible for bulls to sire many more calves than was formerly true. Because of these improvements the differential usage of bulls has increased greatly. Progeny testing programs have developed and many bulls are sampled on a limited number of cows until a progeny test is available. With the development of frozen semen some bulls are used for many years after their death. Some bulls are mated to as many as 50,000 cows per year, although the average is only about 3,000. These factors have combined in such a manner that many feel that the effective number of bulls has decreased greatly although the actual number of bulls in studs has decreased only slightly from its peak in 1957 and 1958.

In an attempt to ascertain the effective use of bulls, the AI studs were asked to furnish information to USDA on the usage of individual bulls in 1966. Twenty-six of the 35 AI organizations were able to report either the number of first services or the number of ampules of semen shipped so that an estimate of number of first services could be obtained.

These 26 AI studs were responsible for about 67 percent of the services to dairy bulls in 1966. In this report bulls were also identified as to whether they were (a) in regular service, (b) in use only for progeny test, or (c) available only for special matings. Many of the bulls that were available only through special matings were dead and only a limited

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1/ The authors wish to express their appreciation to the 26 AI organizations furnishing the information used in this report.

2/ With the technical assistance of C. A. Rampendahl.

supply of semen was available.

Many of the studs were able to report the actual number of first services, but some were able to report only the number of ampules used. A few reported some combination of number of first services and additional ampules sold. When only the number of ampules was reported, it was assumed that about two ampules of semen would be used for each first service. Thus, the bulls involved were credited with half as many first services as there were ampules shipped. In cases where ampules used were reported for all bulls from a stud, the ratio of ampules to total first services in the stud was used to estimate first services by individual bulls.

The number of bulls (1,450) and number of first services (4,321,000) upon which this report is based are shown in table 15, stratified by breed and category of service. Data were not available on services to 562 bulls in 9 studs. Bulls in nonreporting studs serviced slightly over 2 million cows.

Of the 1,450 bulls in service, approximately 62 percent were in the regular category, 32 percent under progeny test, and 6 percent available only through special mating (table 15). The disparity between number of bulls and their effectiveness is shown by the 901 regular service bulls accounting for 92 percent of the inseminations. Slightly over 7 percent of the services resulted from the 470 bulls under progeny test, although they represented 32 percent of the bulls in service. The 79 bulls available through special mating were responsible for less than 1 percent of the services. The pattern appeared to be relatively similar for all the breeds except the Milking Shorthorns and Red Danes.

The average number of inseminations per bull by breed and category of service is shown in table 16. The 569 Holstein bulls in the regular class averaged nearly 6,000 services per bull, which is nearly three times that of any other group. Inseminations to regular bulls in the other major dairy breeds ranged from 1,356 to 2,180, or only about one quarter as many per bull as in the Holsteins. The number of matings per bull in the special group were all relatively small, and the Holsteins

TABLE 15.--Number and distribution of bulls and inseminations on which data were available for 1966

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
----- <u>Number</u> -----								
Ayrshire-----	26	0	9	35	36,206	0	3,508	39,714
Guernsey-----	134	18	67	219	292,173	2,766	34,046	328,985
Holstein-----	569	42	323	934	3,401,634	26,820	240,309	3,668,763
Jersey-----	94	9	58	161	155,853	2,466	22,795	181,114
Brown Swiss--	58	6	13	77	78,627	1,127	7,710	87,464
M. Shorthorn-	16	4	0	20	14,305	414	0	14,719
Red Dane-----	4	0	0	4	241	0	0	241
Total-----	901	79	470	1,450	3,979,039	33,593	308,368	4,321,000

TABLE 16.--Average number of inseminations per bull by breed and type of service for data available in 1966

Breed	Service group			Overall
	Regular	Special mating	Progeny test	
	<u>Number</u>			
Ayrshire-----	1,393	0	390	1,135
Guernsey-----	2,180	154	508	1,502
Holstein-----	5,978	639	744	3,928
Jersey-----	1,658	274	393	1,125
Brown Swiss----	1,356	188	593	1,136
M. Shorthorn---	894	104	0	736
Red Dane-----	60	0	0	60

TABLE 17.--Percentage distributions of inseminations by breed and type of service for data available in 1966

Breed	Type of service			Total among breeds
	Regular	Special mating	Progeny test	
	<u>Percent</u> ^{1/}			
Ayrshire-----	91.2	0	8.8	0.9
Guernsey-----	88.8	0.8	10.3	7.6
Holstein-----	92.7	.7	6.6	84.9
Jersey-----	86.1	1.4	12.6	4.2
Brown Swiss----	89.9	1.3	8.8	2.0
M. Shorthorn---	97.2	2.8	0	.3
Red Dane-----	100.0	0	0	<u>2/0</u>

^{1/} Percentages within breeds.

^{2/} Less than 0.05 percent.

had many more than the other breeds. Breed differences in number of services were least pronounced in bulls under progeny test, where the inseminations ranged from 390 to 744 per bull. Overall, Holstein bulls averaged over twice as many services as the next highest group, the Guernseys. Ayrshire, Jersey, and Brown Swiss bulls all were lower than Guernseys. Services to Milking Shorthorn and Red Dane bulls were much fewer than the other breeds.

The percentage distributions of the services in each breed to bulls in the three types of services are shown in table 17. Of the five major dairy breeds, the Holsteins had the greatest percentage of inseminations by bulls in regular service. However, in the Milking Shorthorns and Red Danes, practically all of the services were to regular bulls. The relative use of special mating bulls was highest in the Milking Shorthorns, Brown Swiss, and Jerseys.

Jerseys devoted nearly twice as high a proportion of their services to progeny testing programs as the Holsteins, although it amounted to only about one service in eight for the Jerseys. The Ayrshires, Guernseys, and Brown Swiss were in between with somewhat similar percentages.

About 85 percent of the 4.3 million services covered in this study were to bulls of the Holstein breed. Guernseys were second with 7.6 percent, and Jerseys third with 4.2 percent. Brown Swiss bulls bred 2 percent of the total, and Ayrshires had slightly less than 1 percent. The percentages of cows bred to Milking Shorthorns and Red Danes were very low. Guernseys, Holsteins, and Jerseys accounted for nearly 97 percent of the services to dairy bulls.

In tables 18, 19, 20, and 21, bulls were grouped by breed according to how many services they had in 1966. Table 18 shows the distribution for regular service bulls, table 19 for special mating bulls, table 20 for bulls under progeny test, and table 21 is an overall grouping containing all bulls. The number of services for each of the groups is also shown.

Data on regular category bulls are presented in table 18 and figure 2. Twenty-one percent (120) of the Holstein bulls

TABLE 18.--The distribution of bulls in regular service by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
----- <u>Number</u> -----					
<u>Bulls in each class</u>					
Ayrshire-----	13	12	1	0	0
Guernsey-----	64	54	12	4	0
Holstein-----	156	191	102	86	34
Jersey-----	52	34	7	1	0
Brown Swiss--	35	20	2	1	0
M. Shorthorn-	10	6	0	0	0
Red Dane-----	4	0	0	0	0
<u>Services to bulls in each class</u>					
Ayrshire-----	3,890	24,074	8,242	0	0
Guernsey-----	25,938	138,442	79,639	48,154	0
Holstein-----	57,660	497,893	732,604	1,157,477	956,000
Jersey-----	18,817	81,601	45,253	10,182	0
Brown Swiss--	12,526	43,963	11,451	10,687	0
M. Shorthorn-	3,261	11,044	0	0	0
Red Dane-----	241	0	0	0	0

TABLE 19.--The distribution of bulls in service available only through special request by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
----- Number -----			
<u>Bulls in each class</u>			
Ayrshire-----	0	0	0
Guernsey-----	18	0	0
Holstein-----	36	5	1
Jersey-----	9	0	0
Brown Swiss-----	6	0	0
M. Shorthorn-----	4	0	0
Red Dane-----	0	0	0
<u>Services to bulls in each class</u>			
Ayrshire-----	0	0	0
Guernsey-----	2,766	0	0
Holstein-----	6,488	13,075	7,257
Jersey-----	2,466	0	0
Brown Swiss-----	1,127	0	0
M. Shorthorn-----	414	0	0
Red Dane-----	0	0	0

TABLE 20.--The distribution of bulls in service only for progeny testing by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
----- Number -----			
<u>Bulls in each class</u>			
Ayrshire-----	9	0	0
Guernsey-----	57	10	0
Holstein-----	253	63	7
Jersey-----	53	5	0
Brown Swiss-----	11	2	0
M. Shorthorn-----	0	0	0
Red Dane-----	0	0	0
<u>Services to bulls in each class</u>			
Ayrshire-----	3,508	0	0
Guernsey-----	14,164	19,882	0
Holstein-----	62,961	128,820	48,528
Jersey-----	9,288	13,507	0
Brown Swiss-----	4,953	2,757	0
M. Shorthorn-----	0	0	0
Red Dane-----	0	0	0

TABLE 21.--The distribution of bulls by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull in all categories of service				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
----- <u>Number</u> -----					
	<u>Bulls in each class</u>				
Ayrshire-----	22	12	1	0	0
Guernsey-----	139	64	12	4	0
Holstein-----	445	259	110	86	34
Jersey-----	114	39	7	1	0
Brown Swiss--	52	22	2	1	0
M. Shorthorn-	14	6	0	0	0
Red Dane-----	4	0	0	0	0
	<u>Services to bulls in each class</u>				
Ayrshire-----	7,398	24,074	8,242	0	0
Guernsey-----	42,868	158,324	79,639	48,154	0
Holstein-----	127,109	639,788	788,389	1,157,477	956,000
Jersey-----	30,571	95,108	45,253	10,182	0
Brown Swiss--	18,606	46,720	11,451	10,687	0
M. Shorthorn-	3,675	11,044	0	0	0
Red Dane-----	241	0	0	0	0

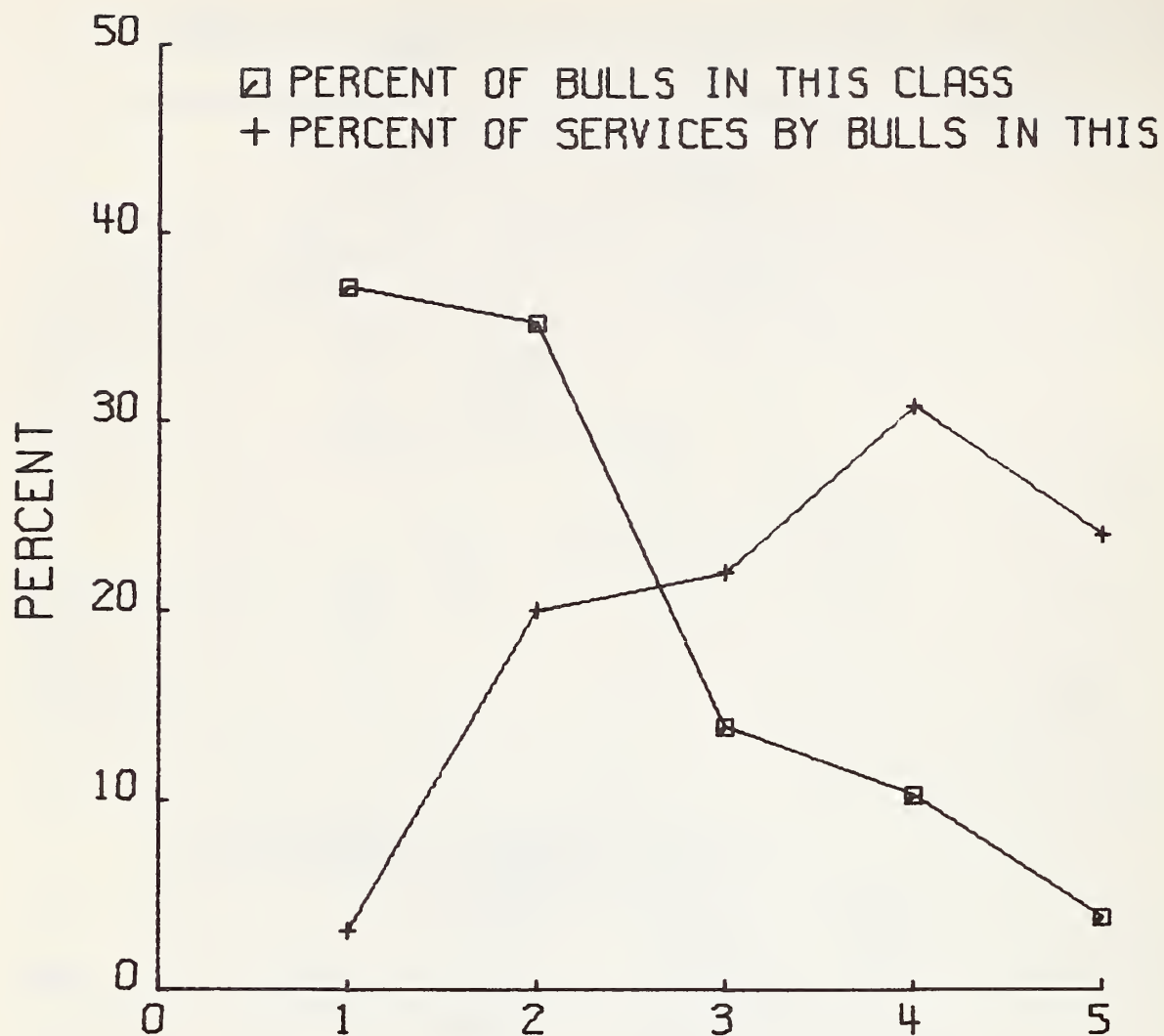


FIGURE 2.--The distribution of bulls in regular service by breed and number of inseminations for data available in 1966.

had over 10,000 services, including 6 percent (34) that had more than 20,000 inseminations. However, no bulls of the other breeds had as many as 20,000 services, and only six bulls in the other breeds had over 10,000. The large number of Holstein bulls (120) having over 10,000 first matings indicates that this amount is biologically feasible, and apparently easily reached. In fact, these 120 Holstein bulls accounted for five-eighths of the services in the Holstein breed or over one in every two inseminations in 1966. Table 18 also shows that the 37 percent of the regular bulls that had less than 1,000 first services each had little impact on the dairy cattle population as they accounted for only 3.1 percent of the breedings. Those having less than 10,000 but more than 1,000 matings accounted for the bulk of the remaining services.

Table 19 indicates that most of the bulls available through special mating had little impact as only six accounted for more than 1,000 inseminations.

Table 20 presents the stratifications for bulls under progeny testing programs. Most of the bulls under progeny testing programs (81.5 percent) had rather limited use (i.e., less than 1,000 services). Holstein bulls were used the heaviest. A question might be raised on whether or not bulls servicing 5,000 cows per year, as some of those so identified as progeny test, are really on a progeny testing program or whether they are simply in a young sire use program.

The overall summary of bulls by breed and category of service is shown in table 21. Figure 3 shows that 55 percent of the bulls in AI were responsible for less than 1,000 inseminations each. Although this group made up more than one-half of the bulls, they accounted for only 5 percent of the 4.3 million breedings used in this study. At the other extreme, the 34 bulls that had over 20,000 first services bred 22 percent of the cows, although they consisted of only 2.3 percent of the bulls. In a like manner, those 86 bulls having between 10,000 and 20,000 matings, although only 6 percent of the bulls in AI, accounted for 28 percent of the breedings. Thus, the contention of many that the effective number of inseminations per bull is considerably greater than the average is borne out. These data

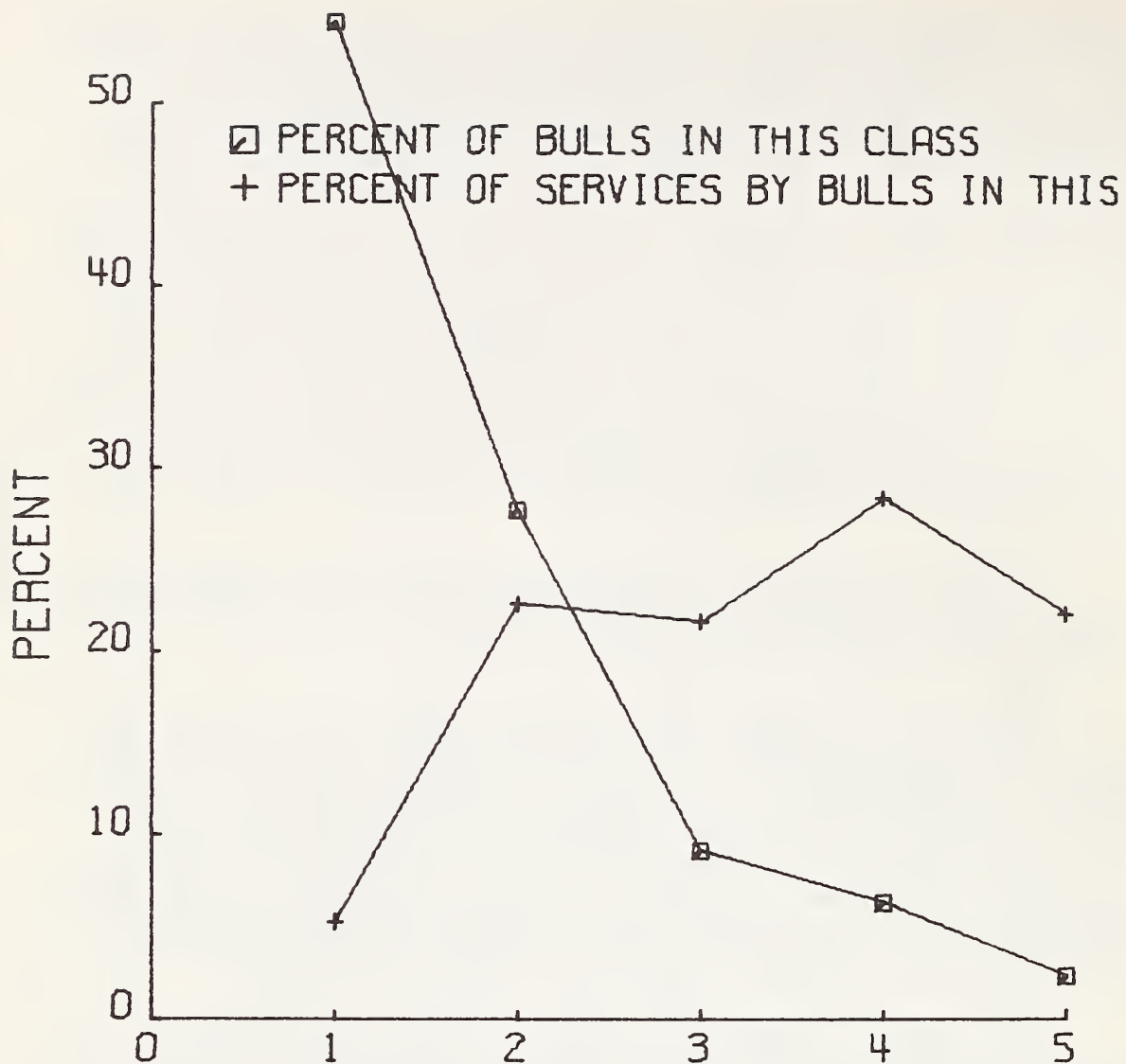


FIGURE 3.--The distribution of bulls by breed and number of inseminations for data available in 1966.

also show that the effective number of bulls in AI in the United States was probably less than half of the 2,010 dairy bulls in AI service in 1966, since there is such a disparity in their use.

The distributions of bulls in the various classes based on number of inseminations by breeds suggest that the latent semen-producing ability of bulls is not exploited very well in any breed except Holsteins. Even with this incomplete utilization, one bull accounted for over 20 percent of the services in the Ayrshire breed.

The distribution of number of inseminations shown in tables 18 and 21 suggests that many AI organizations should be able to reduce the number of bulls they have in regular service without endangering their ability to service their patrons. If this reduction were made, it should be possible to increase the genetic merit of the bulls in AI. It would appear that in most of the breeds other than Holsteins, the best bulls are not being exploited as widely as possible, assuming their semen-producing capacity on the average is as great as that of the Holsteins. This appears logical when one considers that only 28 bulls other than Holsteins had as many as 5,000 services in 1966.

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